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(56) Documents cited
GB 1499266
US 4179137A
US 4244236A
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US 4244237A
US 3803939A
US 4195535A
US 3724290A
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(54) Steering column assembly

(57) A steering column assembly comprises a column part (1), a support (7) rotatably carrying the column part (1), a bracket (8) carrying the support (7) and adapted to be secured to a fixed member, means (16,20) securing the support (7) to the bracket (8) to permit relative movement thereof, and a lock (21,22, 31,43) for fixing the bracket (8) and the support (7) in a desired relative configuration, and including a locking element (31) movable into and out of a locking position and biased into the locking position by spring means, e.g. Belleville washers (40) thereby reducing the risk of accidental unlocking or application of an inadequate locking force.

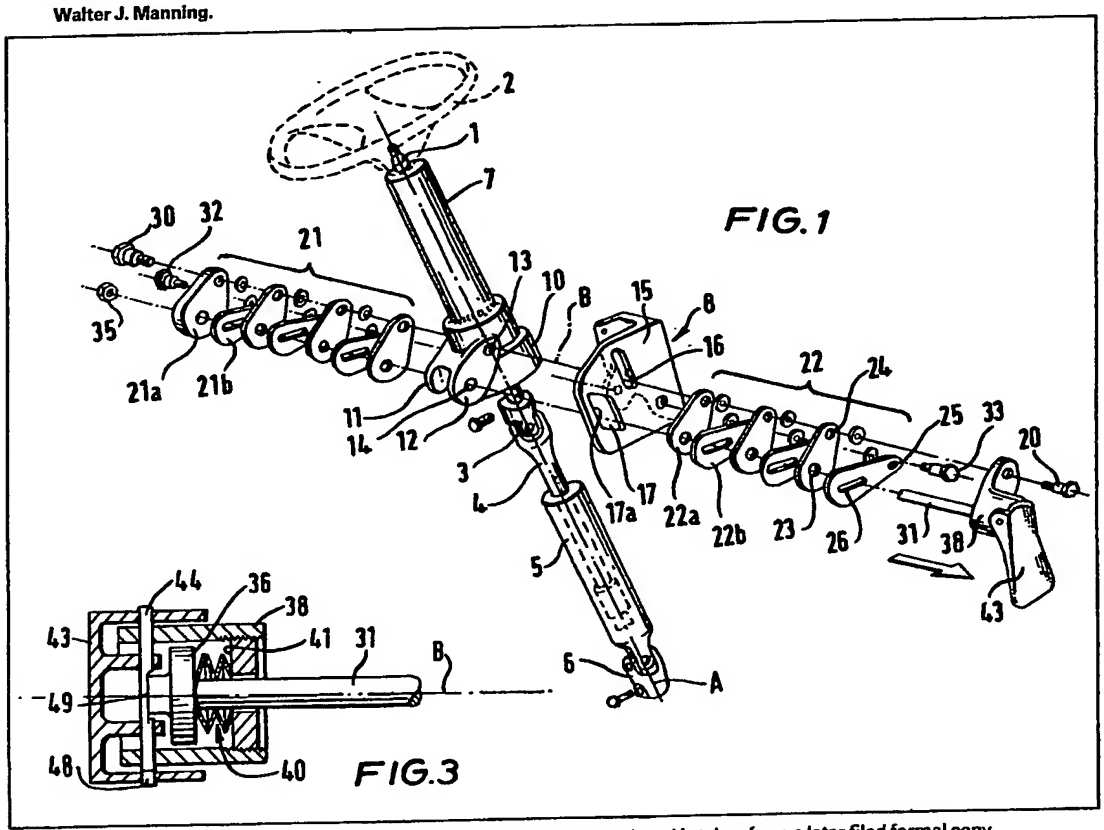

FIG. 1

FIG. 3

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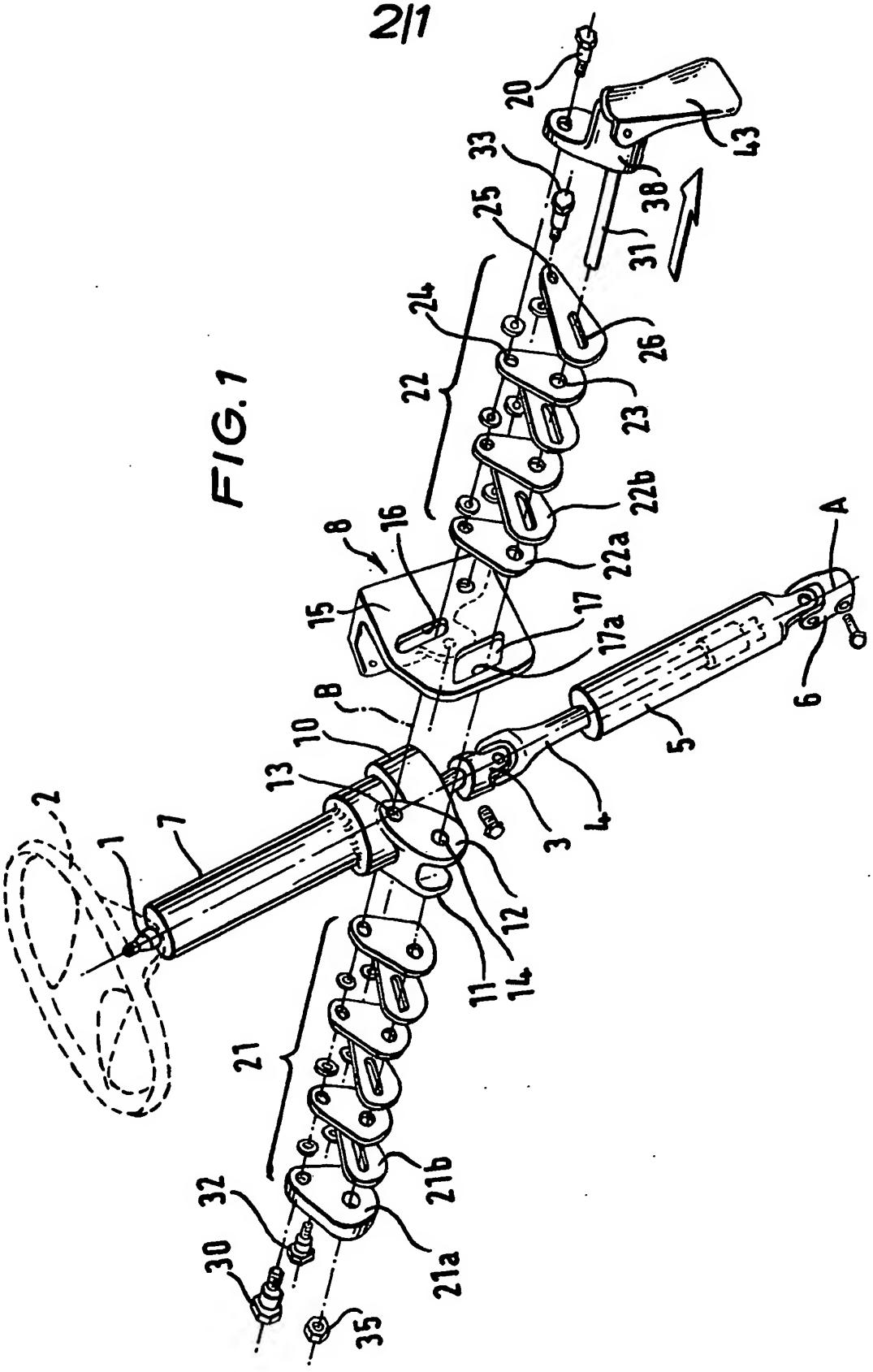
FIG.1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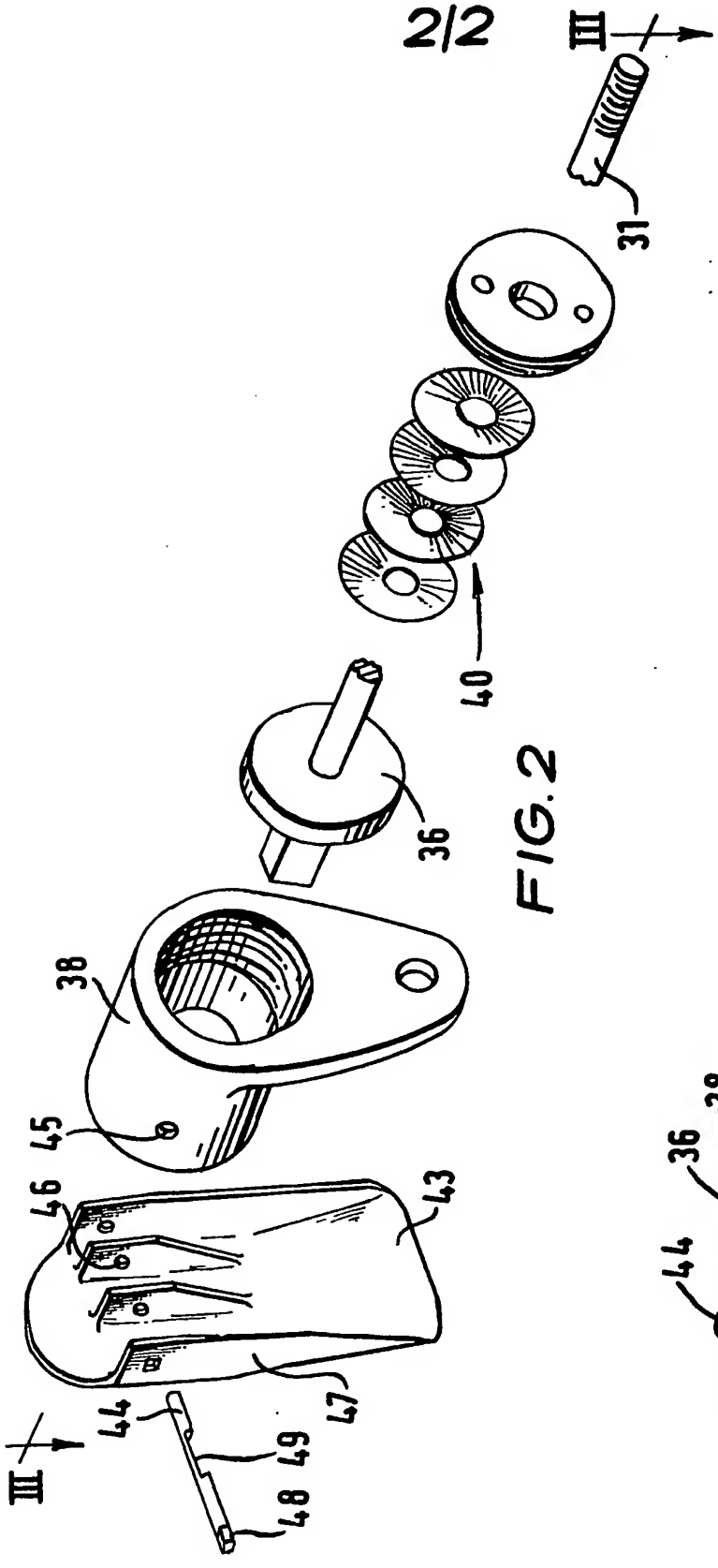

FIG.2

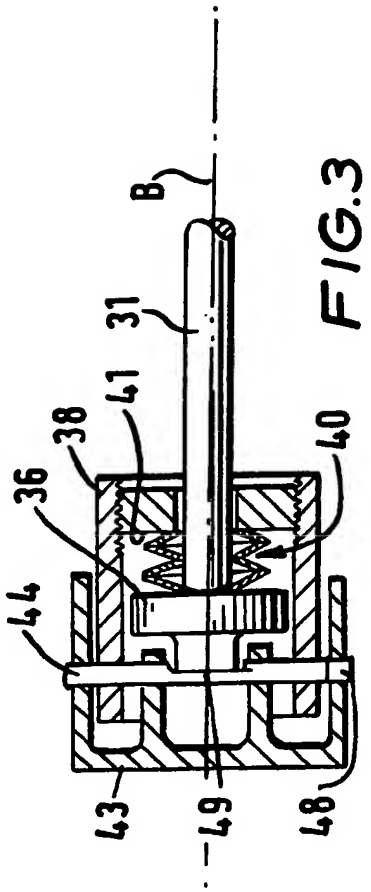

FIG.3

SPECIFICATION

Steering column assembly

This invention relates to steering column assemblies.

Conventional adjustable steering column assemblies comprise a column part, a support rotatably carrying the column part, a bracket carrying the support and adapted to be secured to a fixed member, means securing the support to the bracket to permit relative movement thereof in an axial direction and about an axis perpendicular thereto, and a lock for fixing the bracket and the support in a desired relative configuration. This construction allows the device to adjust the height and/or rake of the assembly to his own needs.

Such assemblies suffer from the disadvantage that the lock can become disengaged, for example as a result of an accidental blow, causing the steering column assembly to move. Moreover, where the locking force is generated by the driver as the column is secured, there is a risk of the assembly being inadequately secured after adjustment.

According to the present invention, there is provided a steering column assembly comprising a column part a support rotatably carrying the column part, a bracket carrying the support and adapted to be secured to a fixed member, means securing the support to the bracket to permit relative movement thereof and a lock for fixing the bracket and the support in a desired relative configuration, the lock including a locking element movable into and out of a locking position, and means biasing the locking element into the locking position.

Since the locking element is positively biased into the locking position, accidental disengagement thereof is prevented. Moreover, the force applied to the lock is determined by the bias applied to the locking element, thereby avoiding the risk of the assembly being inadequately secured after adjustment by the driver.

The present invention is applicable to any type of lock for an adjustable steering column assembly. A frictional lock is however preferred because this allows an infinite number of adjusted positions. Preferably therefore, the lock includes a plurality of friction surfaces movable over each other when the support is moved relative to the bracket, and the locking element is operable to vary frictional force between the friction surfaces.

In the preferred embodiment of the invention, the locking element is preferably movable relative to a mounting fixed relative to the bracket, and an operating lever for the lock is pivotably mounted thereon and connected to the locking element.

In view of the high locking forces required and the relatively short movement of the locking element, Belleville washers are preferred for biasing the locking element. These, or equivalent spring means may be arranged to act between the mounting and the locking element.

A preferred embodiment of the invention will be described, by way of example only, with reference to the drawings in which:-

Figure 1 is an exploded perspective view of a steering column assembly in accordance with the invention;

Figure 2 is a similar view, on an enlarged scale, of part of the assembly of Figure 1; and

Figure 3 is a cross-section taken along the line III-III of Figure 2.

Referring to the drawings, the steering column assembly comprises a first column part 1 carrying a steering wheel 2 at its upper end and attached to its lower end by a first universal joint 3 to the upper end of a second column part 4. The second column part 4 is telescopically received within a third column part 5, the lower end of which carries a second universal joint 6 by means of which the assembly can be attached to a steering box (not shown). This construction allows the first column part 1 to be both raised in the direction of the axis A of the assembly and tilted relative to the second column part 4, about an axis B extending at right angles thereto.

The first column part 1 is rotatably mounted in a tubular support 7 which is in turn carried by a bracket 8 by means of which the assembly is secured to a fixed member in a vehicle driving compartment. The lower end of the support 7 carries a collar 10 which is provided with two flat friction faces 11, 12 extending in a plane at right angles to the transverse axis B. The faces 11 and 12 are each provided with a threaded bore 13 extending along the axis B, and a plane bore 14 extending parallel to the axis B but radially spaced therefrom.

The bracket 8 includes a flange 15 extending in a plane parallel to the faces 11 and 12 on the collar 10. A slot 16 in the flange 15 extends in a direction parallel to the axis A, and an aperture 17 defining a parallelogram-shaped guide surface 17*a* in the flange 15 is radially off set from the slot 16. The support 7 is connected to the bracket 8 by means of a headed pivot pin 20 which passes through the slot 16 and into the threaded bore 13 in the friction face 11, the pin 20 being slidable and pivotable in the slot, thereby permitting the suppport 7 to move relative to the bracket 8 along the axis A, and to pivot about the axis B.

In order to fix the bracket 8 and the support 7 in a desired angular orientation, the assembly includes a lock mechanism which comprises two sets of friction plates 21, 22, one on each side of the collar 10, overlying the friction surfaces 12 and 11 respectively. These plates are arranged at right angles to the axis B and, together with the friction surfaces 11 and 12 of the collar 10 and the face of the flange 15 on the bracket 8 against which it lies, move over each other when the support 7 is moved relative to the bracket 8. Each set of friction plates comprises three pairs of similar plates 21*a*, 21*b*, 22*a*, 22*b*. In each pair of plates, each plate 21*a*, 22*a* is provided with two bores 23, 24 having a spacing equal to that between the threaded bore 13 and the plane bore 14 in the friction faces 11 and 12, and the other plates 21*b* 22*b* are provided with a corresponding bore 25 and slot 26. The plates 21*a*, 22*a* are respectively fixed to the support 7 through one of the bores 24 therein by means of the pivot pin 20 and a corresponding pivot pin 30 which is received in the threaded bore 13 in

the friction face 12 and through the other of the bores 23 therein by a locking bar 31 which extends parallel to the axis B through the aperture 17 in the bracket 8 and the plane bores 14 in the friction faces 11 and 12. The plates 21*b*, 22*b* are pivotably connected to the bracket 8 by headed pivot bolts 32, 33 which are received in threaded bores in the bracket 8. They are also pivotably connected to the support 7 by means of the locking bar 31, which also passes through the slots 26 therein, the slots allowing sliding movement of the friction plates 21*b*, 22*b* relative to the plates 21*a*, 22*a*.

One end of the locking bar 31 is threaded and carries a retaining nut 35 which abuts the outer end plate 21*a* of the set 21 of friction plates. As best seen in Figures 2 and 3, the other end of the locking bar 31 is shaped to define a radial abutment 36 adjacent the end. This end portion of the locking bar 31 is housed within a mounting 38 secured to the bracket 8 by the pivot pin 20. The face of the mounting nearer to the bracket 8 extends at right angles to the axis B and offers a further friction surface for cooperation with the surface of the adjacent friction plate 22*b*.

A set of disc springs 40 is positioned between the abutment 36 on the locking bar 31 and a radial face 41 of the mounting 38 and bias the locking bar 31 to the left as seen in Figure 3. In this position, the force exerted by the disc springs 40 compresses the two sets 21, 22 of friction plates thereby generating a frictional force between the surfaces thereof and between the abutting surfaces of the mounting 38, the flange 15 of the bracket 8 and the two friction surfaces 11, 12 on the collar 10 of the support 7, the total frictional force being sufficient to prevent a driver from moving the support 7 relative to the bracket 8.

In order to permit movement of the support 7 and thereby to allow the driver to adjust the steering column part 1, the locking bar 31 may be moved to the right as seen in Figure 1 by means of an operating lever 43. The lever 43 is connected to the mounting 38 for movement about a horizontal axis by means of a pin 44 which passes through two apertures 45 in the mounting 38 and is secured as a press fit in four apertures 46 formed in flanges 47 on the lever 43. One end 48 of the pin is of square cross-section and engages with a square aperture in one of the flanges 47 so that the pin 44 cannot rotate relative to the lever 43. A central section 49 of the pin 44 is of reduced cross-sectional size and is eccentric with respect to the axis of the pin. This central section 49 abuts the end of the locking bar 31 and is so disposed that, as the lever is raised from the vertical position illustrated in Figure 2, the central section displaces the locking bar 31 to the right. This compresses the disc springs 31 and reduces the frictional force between the friction plates sets 21, 22, the mounting 38 and the bracket 8 and support 7. The driver may then adjust the upper column part about the axis B and along the axis A. This movement will be accompanied by a scissor-like sliding movement of the friction plates 21, 22. By suitably shaping the surface of the central section 49 of the pin 44, the reaction force exerted on the pin by the locking bar 31 can be used to retain the lever in the horizontal position, leaving both the driver's hands free to adjust the upper column part 1.

The range of relative movement of the support 7 and the bracket 8 is however limited since the locking bar, which is fixed in the plane bores 14 in the collar 10 of the support 7 can only move within the limits of the guide surface 17*a* formed by the inner edge of the aperture 17 in the bracket. As a result the driver can only adjust the upper part 1 of the steering column within the limits defined by the aperture 17, and therefore does not run the risk of positioning the steering wheel too close to adjacent objects in the drivers compartment of the vehicle. When the driver has moved the steering column into a suitable position, he releases the operating lever 43, and the locking bar 31 is moved by the Belleville washers 40 to effect automatic engagment of the friction surfaces in the assembly 10 that the column is locked in place. Since the locking bar 31 is biased into its locking position, the chances of accidental release of the steering column for adjustment are reduced. Moreover the locking force applied by the locking bar 31 is determined by the disc springs 40 and is independent of forces applied to the lock by the driver.

CLAIMS

1. A steering column assembly comprising a column part, a support rotatably carrying the column part, a bracket carrying the support and adapted to be secured to a fixed member, means securing the support to the bracket to permit relative movement thereof and a lock for fixing the bracket and the support in a desired relative configuration, the lock including a locking element movable into and out of a locking position, and means biasing the locking element into the locking position.

2. An assembly according to Claim 1 wherein the lock comprises a plurality of friction surfaces movable over each other when the support is moved relative to the bracket, and the locking element is operable to vary the frictional force between the friction surfaces.

3. An assembly according to Claim 1 or Claim 2 wherein the locking element is movable relative to a mounting fixed to the bracket, and an operating lever for the lock is pivotally mounted on the mounting and connected to the locking element.

4. An assembly according to Claim 3 wherein the means for biasing the locking element comprises a spring acting between the link and the mounting.

5. An assembly according to any one of Claims 1 to 4 wherein the means for biasing the locking element comprises one or more disc springs.

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